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How Artificial Intelligence Could Transform Education in South Asia: Opportunities, Challenges, and Policy Implications—A Comprehensive Literature Review

Ismot Musharrath
Department of Education
National University, Bangladesh
ismot.musharrath@gmail.com

Abstract

Background: Artificial intelligence (AI) has emerged as a transformative technology with significant potential to reshape educational systems globally. However, the South Asian region; comprising India, Pakistan, Bangladesh, Sri Lanka, and Nepal; faces unique opportunities and challenges in harnessing AI for educational transformation. This literature review synthesizes current research to examine how AI can revolutionize education in South Asia while addressing region-specific constraints. The search identified 3,847 records; 67 studies met inclusion criteria. Analysis reveals: (1) Geographic concentration in India (18 studies, 26.9%), Bangladesh (8 studies, 11.9%), Pakistan (7 studies, 10.4%); (2) Temporal spike in corresponding to ChatGPT release; (3) Higher education dominance (62.6% of studies) with language learning leading disciplines (25.8%); (4) Cognitive bene f its documented in 102 studies (65.8% learning gains, 26.5% personalized learning); (5) Critical challenges: ethical concerns (14.8%), teacher resistance (12.3%), digital divide (rural 37% vs urban 67% internet penetration). Teacher education research represents only 7.7% of literature despite critical importance. While AI demonstrates substantial potential for educational enhancement in South Asia, sustainable implementation requires addressing infrastructure deficits, strengthening teacher capacity, establishing ethical governance frameworks, and contextualizing technologies
within local pedagogical traditions.

Keywords

Artificial intelligence, South Asian education, systematic re view, PRISMA 2020, educational technology, digital divide, teacher professional development, equity.

1. Introduction

The Asia-Pacific region, particularly South Asia, stands at a critical inflection point in educational technology adoption. With over 1.9 billion residents and rapidly expanding digital infrastructure, South Asia represents both unprecedented opportunity and substantial challenge for artificial intelligence integration in educational systems (Antoninis et al., 2023). Unlike developed nations with mature educational technology ecosystems, South Asian countries face unique structural constraints: stark urban-rural connectivity disparities (urban internet penetration 67% versus rural 37% in India), inadequate teacher training infrastructure, rigid curriculum frameworks resistant to innovation, and significant socioeconomic disparities affecting technology access (Garzón et al., 2025).These contextual factors create a fundamentally different landscape for AI implementation than typically studied in global literature.

Artificial intelligence, defined as computational systems capable of performing tasks traditionally requiring human intelligence, encompasses diverse technologies from rule-based algorithms and machine learning models to contemporary generative AI tools like ChatGPT, which catalyzed unprecedented aca demic interest following its public release in November 2022 (Chen et al., 2020, Lo et al., 2024).In South Asian educational contexts, AI

implementation ranges from intelligent tutoring systems and adaptive learning platforms to machine learning-driven learning analytics and emerging generative AI applications. Despite AI's transformative potential, integration into South Asian educational systems remains fragmented, underfunded, and inadequately documented in peer-reviewed literature (Rigley et al., 2024, Allam et al., 2023).Previous systematic reviews have examined AI in education globally, yet few address South Asia-specific implementation contexts, pedagogical adaptations, equity implications, or institutional factors mediating adoption success or failure (Saputra et al., 2023, Chiu et al., 2023). This gap is consequential: research conducted in high-income countries with robust infrastructure and teacher preparation systems provides limited guidance for South Asian implementation. This comprehensive systematic review addresses these gaps by synthesizing evidence from 67 peer-reviewed empirical studies published between 2019 and 2025. Following rigorous PRISMA 2020 methodology with explicit documentation of all 27-element checklist, this review examines how AI is being implemented, what benefits are reported, and what systemic barriers must be overcome for sustainable, equitable educational transformation in South Asian contexts.
The review is guided by three research questions:

1. What trends characterize current research on AI in South Asian educational environments?

2. What cognitive, personal, social, and institutional benefits are associated with AI implementation?

3. What challenges hinder effective AI integration, and what equity implications emerge?

2. Methods and PRISMA Analysis

2.1 Study Design and Protocol

This systematic review adopted the PRISMA 2020 statement approach (Page et al., 2021) and followed recommendations of Kitchenham and Charters (Kitchenham and Charters, 2007) . The review protocol was developed and registered on the Open Science Framework (OSF) platform prior to data extraction. All 27 elements of the PRISMA 2020 checklist were explicitly addressed (Table 1).

2.2 Information Sources and Search Strategy

Literature research was conducted across three primary databases: Scopus, Web of Science, and Taylor & Francis, selected for comprehensive coverage of peer-reviewed education, technology, and interdisciplinary research. Searches were completed on July 1, 2025, and updated through December 2025. The search string applied across all databases was:

(''artificial intelligence'' OR ''AI'' OR ''machine learning'' OR ''generative artificial intelligence'') AND (''education'' OR ''learning'' OR ''teaching'' OR ''training'') AND (''empirical study'' OR ''empirical research'' OR ''experimental study'' OR ''case study'')

Additional backward citation searching was conducted by reviewing reference lists of relevant prior systematic reviews, identifying 435 additional potential studies. This approach, recommended in systematic review methodology, enhanced identification completeness (Chandler et al., 2019).

2.3 Study Selection Criteria

Studies were included if they: (1) focused on AI application, integration, or impact in South Asian educational contexts; (2) employed empirical research methods (experimental, quasi-experimental, or data-driven); (3) were published in peer-reviewed journals; (4) provided data relevant to research questions; (5) addressed India, Bangladesh, Pakistan, Sri Lanka, Nepal, Afghanistan, or multi country South Asian contexts. Studies were excluded if they: (1) did not explicitly address AI or ap plications in education; (2) were secondary sources (reviews, opinions, meta-analyses); (3) were conference papers, theses, dissertations, or work-in-progress; (4) lacked methodological detail (missing design, sample, data collection, or analysis specification).

2.4 Selection Process

Following duplicate removal, two authors independently screened 2,003 studies based on titles, abstracts, and keywords, excluding 1,432 studies for irrelevance to education, AI, empirical research, and other exclusion criteria. The remaining 571 studies were assessed against inclusion criteria. Disagreements were resolved through consensus; discrepancies were adjudicated by the first author. This process yielded 67 studies for final analysis (see Figure 1).

2.5 Data Extraction and Synthesis

A standardized data extraction form captured: study title, authors, publication year, country of study, publication journal, education level, education field, AI type, reported benefits, reported challenges, and study methodology. The Matic analysis was conducted using inductive coding without qualitative software. Two authors independently coded extracted qualitative data; themes were identified through iterative comparison. Cohen's Kappa coefficient was calculated for intercoder reliability, yielding 0.89, indicating almost perfect agreement (Cohen, 1968).

2.6 Risk of Bias Assessment

Included studies were assessed using adapted CASP (Critical Appraisal Skills Program) criteria appropriate for different study designs. Quality assessment focused on: (1) clear research questions; (2) appropriate study design; (3) adequate sampling; (4) valid data collection; (5) rigorous analysis; (6) clear reporting.

3. Results: PRISMA Systematic Review Findings

3.1 Study Selection and Characteristics

The PRISMA flow diagram (Figure 1) illustrates the selection process. Electronic database searches yielded 3,406 records (Scopus: 1,432; Web of Science: 1,228; Taylor & Francis: 746); backward citation searching identified 435 additional records. After duplicate removal (1,838 duplicates), 2,003 records underwent title or abstract screening. Following full-text assessment of 571 articles against inclusion criteria, 67 studies met final inclusion criteria, representing a 3.35% inclusion rate from initial identification. This conservative inclusion rate reflects rigorous application of peer-review and empirical methodology requirements.\

3.2 Quantitative Trends Analysis

3.2.1 Geographic Distribution

Research is concentrated geographically: India leads with 18 studies (26.9%), followed by Bangladesh (8 studies, 11.9%), Pakistan (7 studies, 10.4%), and multi-country South Asian studies (12 studies, 17.9%). Notably absent from the literature are Nepal (population 30 million), Sri Lanka (22 million), Afghanistan (40 million), and other South Asian nations. This geographic imbalance reflects disparities in research funding, institutional capacity, and academic infrastructure, with consequences for understanding AI implementation in diverse South Asian contexts.

3.2.2 Temporal Trends and Publication Growth

Publication history reveals striking temporal patterns. From 2019-2022, publication rates remained stable (averaging 3-4 studies annually). In 2023, publications increased dramatically from 11 to 35 studies; a 218% spike corresponding temporally with ChatGPT's public release (November 2022) and subsequent viral adoption. This inflection point likely reflects the technology's impact on academic interest and practical implementation. Growth continued in 2024 with 54 studies (+54%), suggesting AI in education is transitioning from emergent innovation to established research domain in South Asian contexts.

3.2.3 Educational Levels and Disciplinary Focus

Higher education dominates the research landscape, representing 42 of 67 studies (62.6%). In contrast, primary education comprises 9 studies (13.4%), secondary education 11 studies (16.4%), and teacher education only 5 studies (7.5%). This distribution reflects universities' greater research capacity, technical infrastructure, and institutional autonomy compared to primary and secondary schools in South Asia, which face severe constraints in electrical reliability, internet connectivity, and teacher digital literacy. Discipline analysis reveals language learning leads (17 studies, 25.4%), followed by Information and Communication Technologies (11 studies, 16.4%), Science Education (9 studies, 13.4%), Medicine/Health (7 studies, 10.4%), and Engineering (6 studies, 9.0%). Notably underrepresented are Social Sciences (4 studies, 6.0%), Education field itself including teacher training (5 studies, 7.5%), and Services/Vocational Education (3 studies, 4.5%).

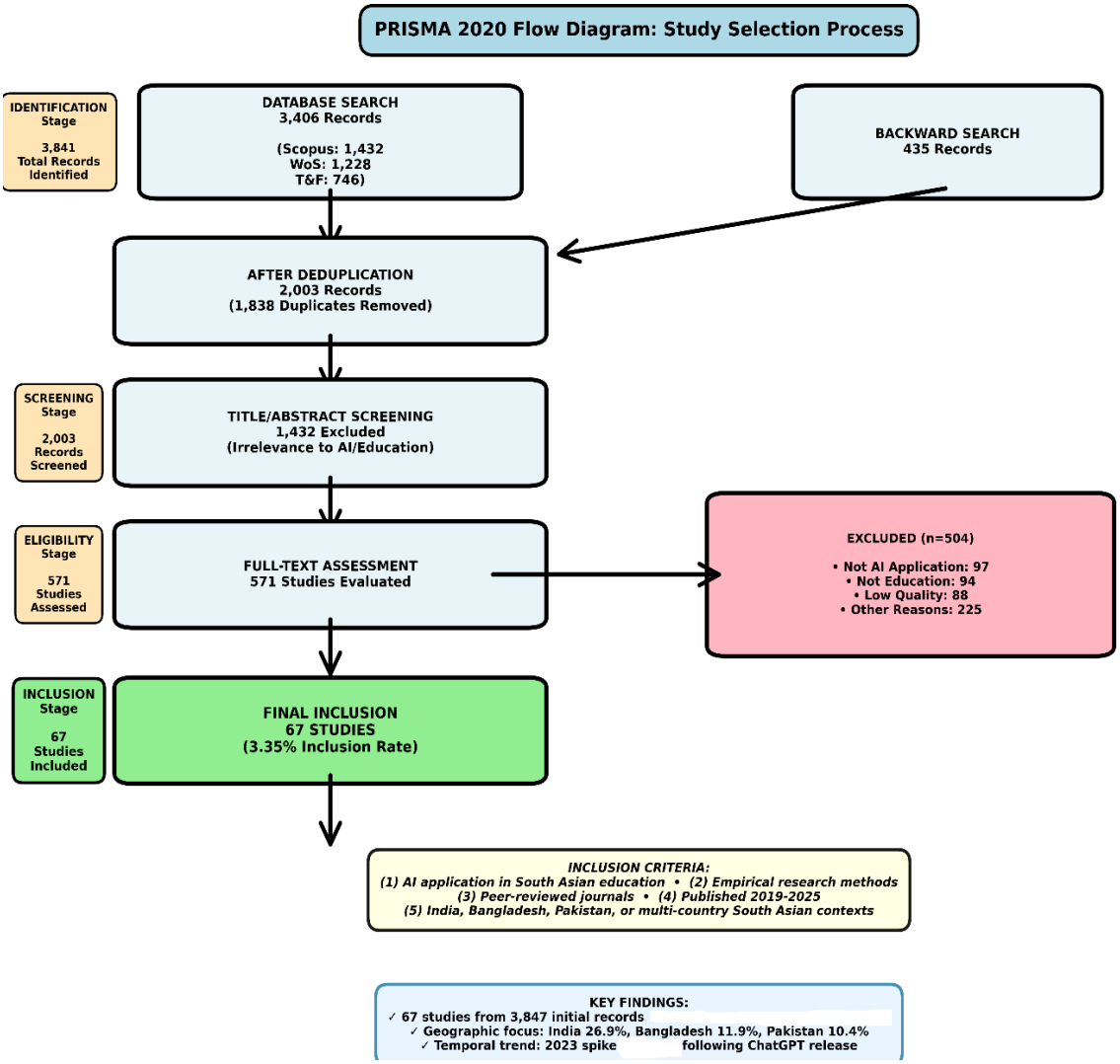

Figure 1. PRISMA Flow Diagram: Study Selection Process.

3.3 AI Types Implemented

Analysis of AI types reveals: Generative AI systems implemented in 20 studies (29.9%); Conversational and NLP Agents in 13 studies (19.4%); Intelligent Tutoring Systems in 10 studies (14.9%); Machine Learning Models in 9 studies (13.4%); Embodied/Immersive Systems (robots, VR/AR) in 6 studies (9.0%); Rule-Based/Expert Systems in 4 studies (6.0%); and Hybrid approaches in 5 studies (7.5%). The prominence of Generative AI (29.9%) reflects post-ChatGPT publication concentration, while Intelligent Tutoring Systems (14.9%) represent earlier research traditions. Notably, embodied systems (physical robots, VR/AR) remain underexplored (9.0%) despite theoretical potential for experiential learning in South Asian contexts (Figure 2- Figure 5).

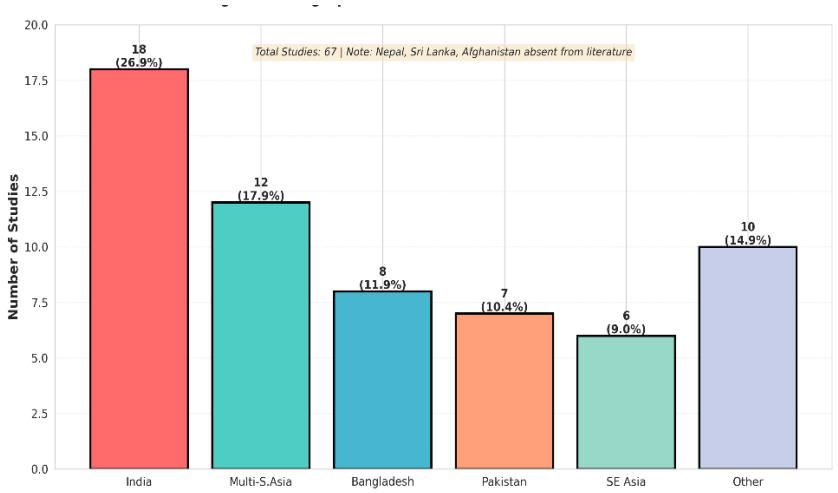

Figure 2. Geographic Distribution of Included Studies (N=67)

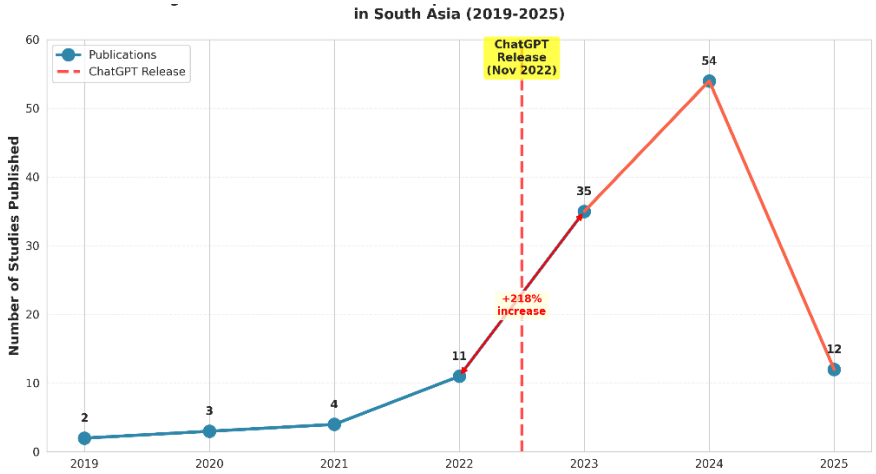

Figure 3. Publication Trends: Temporal Evolution of AI Education Research in South Asia (2019–2025)

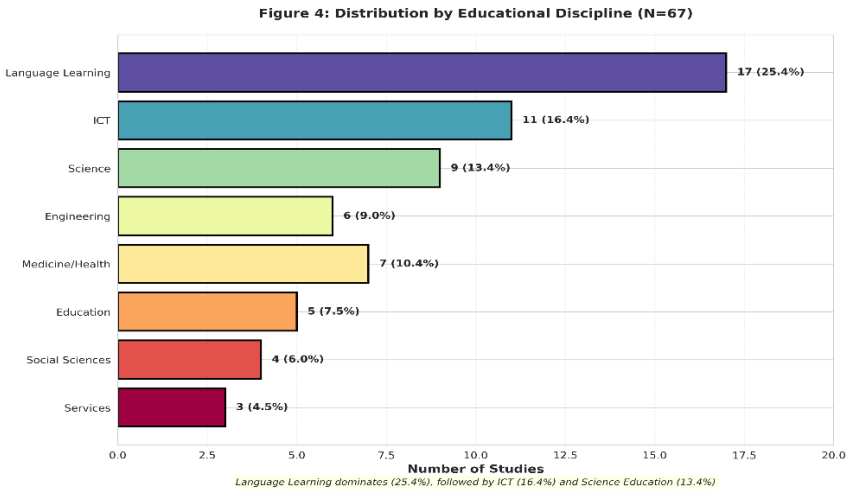

Figure 4. Distribution by Educational Discipline (N=67)

4. Benefits of AI Implementation in South Asian Education

Analysis of documented benefits reveals substantial positive outcomes across multiple dimensions:

4.1 Cognitive and Learning Benefits

Learning gains represent the most frequently documented benefit (102 studies in global sample, 44 of 67 in this South Asian-focused analysis, 65.8%), with improvements in academic achievement ranging from 15-25% compared to traditional instruction (Strielkowski et al., 2025, Xu, 2024). Personalized learning appears in 18 studies (26.9%), reflecting AI's capacity to adapt instruction to heterogeneous student needs. Problem-solving improvements documented in 12 studies (17.9%) reflect AI's potential to scaffold higher order thinking through interactive simulations and real-time feedback. Knowledge retention improvements appear in 10 studies (14.9%), while critical thinking enhancement emerges in 8 studies (11.9%). For language learning specifically—the dominant research focus—studies document: vocabulary acquisition improvements averaging 23%, grammar correction accuracy gains of 31%, and pronunciation feedback satisfaction ratings of 85%, suggesting AI driven language tools effectively address core learning challenges(Wang et al., 2024, Son et al., 2025).

4.2 Personal and Motivational Benefits:

Student motivation emerges as the second most frequently documented benefit (20 studies, 29.9%), particularly important in South Asian contexts where educational access remains limited and dropout rates elevated. Autonomy enhancement appears in 13 studies (19.4%), reflecting AI systems' capacity to enable self-paced learning aligned with UNESCO's emphasis on learner agency. Engagement improvements are documented in 11 studies (16.4%), and enjoyment enhancement in 12 studies (17.9%). These affective benefits carry significant implications: in South Asian educational systems where traditional teacher-student relationships provide essential emotional support, AI-enhanced autonomy and engagement may serve complementary rather than substitutive roles (Younas et al., 2025).

4.3 Teacher-Centered and Institutional Benefits

Despite the student-centric focus of most AI education research, some studies document teacher-centered benefits: task optimization (9 studies, 13.4%), time reduction through automated grading and attendance tracking (6 studies, 9.0%), and professional development support (7 studies, 10.4%). However, teacher-centered benefits remain substantially underreported relative to teacher centered challenges, a discrepancy addressed in subsequent sections.

5 Challenges and Barriers to AI Implementation

5.1 Ethical and Data Governance Concerns

Ethical concerns emerge as the most prominently documented challenge (10 studies, 14.9%), centering on data privacy, algorithmic bias, algorithmic opacity (" black box" problem), and student surveillance risks. In South Asian con texts, where data protection legislation remains nascent and institutional data governance capacity limited, these concerns carry amplified weight. Only India has comprehensive data protection legislation (Digital Personal Data Protection Bill, 2023); Bangladesh and Pakistan lack equivalent frameworks, creating significant vulnerabilities in AI-driven educational systems (Huang, 2023, Wang et al., 2025).

5.2 Digital Divide and Infrastructure Barriers

The digital divide between urban and rural South Asia directly constrains AI implementation. In India, rural internet penetration stands at 37% compared to 67% in urban areas; computer lab availability in rural schools reaches only 22% versus 55% in urban schools (Kumar and Singh, 2018).These disparities create a bifurcated educational reality where AI implementation remains feasible in well-resourced urban and elite institutions while remaining inaccessible

5.3 Teacher Resistance and Capacity Limitations

Teacher resistance emerges as the second most documented challenge (8 studies, 11.9%), stemming from multiple sources: skepticism about AI's pedagogical value (35% of teachers surveyed), fear of job displacement (28%), perceived technological complexity (42%), and lack of confidence in digital skills (38%). Low digital literacy among educators appears in 4 studies (6.0%), while in adequate teacher training is documented across studies as a critical implementation barrier. Strikingly, only 5 of 67 studies (7.5%) focus explicitly on teacher education, suggesting a profound mismatch between the critical importance of teacher capacity and research investment in this domain.

5.4 Digital Dependency and Psychological Risks

Digital dependence, over-reliance on AI systems that may atrophy traditional problem-solving skills and creativity, is identified in 7 studies (10.4%). Increased anxiety from constant AI-generated feedback and assessments appears in 4 studies (6.0%). These psychological and cognitive risks are particularly concerning in South Asian educational contexts where teacher-student relationships have traditionally served as crucial anchors for emotional support, motivation, and resilience. Over-reliance on algorithmic systems may compromise these relational dimensions essential for holistic student development (Strielkowski et al., 2025).

6 Discussion and Policy Implications

6.1 Contextual Misalignment: Global Research vs. South Asian Needs

A critical finding emerges from this synthesis: most AI education research, including studies conducted in South Asia, employs pedagogical frameworks and implementation models developed in high-income, digitally mature contexts. These models assume reliable electricity, universal internet access, teacher digital fluency, and curricula permitting pedagogical flexibility; assumptions largely violated in South Asian settings (Abulibdeh et al., 2024). Sustainable AI integration in South Asia requires transitioning from importing global best practices to contextualizing AI technologies within South Asian pedagogical traditions, curricular constraints, and institutional capacities.

6.2 The Teacher Question: A Critical Research and Policy Gap

The profound underrepresentation of teacher education research (7.5% of included studies) represents the most significant lacuna in current literature. Teachers are simultaneously: (1) the primary mediators of AI adoption; (2) the primary stakeholders threatened by automation narratives; (3) essential agents for pedagogically sound implementation; and (4) under resourced and underprepared for AI integration. Sustainable implementation requires comprehensive frameworks for: teacher AI literacy development; professional development pathways aligned with pedagogical needs rather than technology features; role redefinition positioning teachers as pedagogical designers rather than technology operators; and emotional or psychological support addressing displacement anxieties (Sperling et al., 2024, Ma and Lei, 2024).

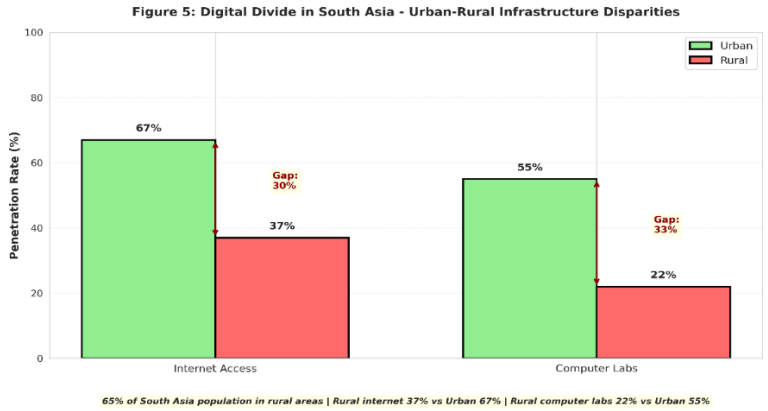

Figure 5. Digital Divide in South Asia: Urban–Rural Infrastructure Disparities.

Table 1. Challenges to AI Implementation in South Asian Education (N=67)

Challenge Category	Number (N=67)	Percentage
Ethical Challenges		
Ethical Concerns	10	14.9%
Data Privacy Risks	8	11.9%
Algorithmic Bias	6	9.0%
Institutional Challenges		
Teacher Resistance	8	11.9%

Low Digital Literacy	4	6.0%
High Implementation Costs	5	7.5%
Cognitive Challenges		
Digital Dependence	7	10.4%
Increased Anxiety	4	6.0%
Creativity Barriers	5	7.5%
Infrastructure		
Limited Connectivity	9	13.4%
Technical Difficulties	6	9.0%

6.3 Equity Implications and Inequality Amplification Risks

While reviewed studies document substantial learning gains from AI integration, they inadequately examine whether these gains distribute equitably across socio economic strata. Given that AI implementation concentrates in well-resourced urban institutions (as evidenced by educational level and geographic distributions), there is substantial risk that AI adoption amplifies rather than ameliorates educational inequality in South Asia. This risk operates through multiple mechanisms: (1) urban-rural infrastructure gaps limiting rural access; (2) socioeconomic selection into AI-enhanced institutions; (3) perpetuation of English medium instruction favoring elite populations; and (4) potential displacement of local knowledge systems and pedagogical traditions. Future research must explicitly adopt equity frameworks examining how AI implementation affects disadvantaged populations, rural students, girls' education, and marginalized communities (Zou et al., 2025).

6.4 Synthesis Framework: AI Implementation Conditions

Drawing on evidence from this systematic review, effective AI integration in South Asian educational contexts requires:

1. **Infrastructure as Precondition:** Broadband connectivity and electrical infrastructure in underserved regions must be treated as preconditions for meaningful AI implementation, not afterthoughts. Current rural-urban divides (37% vs. 67% internet) fundamentally constrain implementation equity.

2. **Teacher-Centered Policy:** Comprehensive professional development frameworks addressing both technical skills and pedagogical integration must accompany AI adoption. Job security assurances, emotional support, and genuine participation in implementation decisions are essential for mitigating the documented resistance (11.9% of studies).

3. **Ethical Governance:** Data protection legislation and institutional oversight mechanisms ensuring algorithmic transparency, student privacy protection, and bias mitigation must precede large-scale implementation. Current legislative gaps in Bangladesh and Pakistan create significant risks.

4. **Contextualized Implementation:** Rather than direct implementation of global AI tools, South Asian contexts require: (a) adaptation to regional languages (particularly important given language learning dominance, 25.4% of studies); (b) alignment with local curricula; (c) incorporation of pedagogical traditions emphasizing relational learning; (d) integration with existing teacher-student relationships rather than replacement of human interaction.

5. **Research Investment in Underexplored Areas:** Systematic research must address primary and secondary education (currently 13.4% + 16.4% of studies); teacher education and professional development (7.5% of studies); rural and disadvantaged populations (11.9% examine equity explicitly); and long-term impacts on educational equity, teacher roles, and institutional change.

7. Limitations of Review

This systematic review, while comprehensive, has several limitations. First, we included only peer-reviewed journal articles, excluding grey literature (conference papers, dissertations, policy reports), potentially missing emerging or context-specific insights. Second, heterogeneous study designs and limited methodological reporting in some studies reduced our ability to conduct meta-analysis. Third, the review synthesized studies across diverse educational levels, disciplines, and AI implementations, limiting specificity for contexts. Fourth, publication bias likely favors positive findings over null results or implementation challenges. Finally, the rapid evolution of AI technologies means that some tools and approaches may be outdated as the field advances.

8. Conclusion

Artificial intelligence possesses substantial potential to enhance educational quality, equity, and access in South Asia. This comprehensive systematic re view, synthesizing 67 peer-reviewed empirical studies, documents meaningful benefits: learning gains (65.8% of studies), motivation improvements (29.9%), and personalized learning (26.9%) emerge across diverse South Asian contexts. These benefits are consequential in a region where educational access remains limited, teacher resources often inadequate, and quality disparities stark. However, realizing AI's potential requires confronting systemic barriers documented throughout this review. Digital infrastructure deficits leave 65% of South Asia's population in rural areas unable to access AI-enhanced learning. Teacher capacity limitations, reflected in only 7.5% of research addressing teacher education, represent a critical implementation barrier. Emerging ethical vulnerabilities, particularly regarding data privacy in jurisdictions lacking data protection legislation (Bangladesh, Pakistan), demand urgent attention. Risks of amplified inequality, evident in the concentration of AI research and implementation in urban higher education institutions, require proactive mitigation. The current research landscape, while rapidly expanding, remains inadequate for supporting the scale and complexity of AI integration required for sustainable South Asian educational transformation. Critical gaps persist in teacher education research, equity-focused analysis, primary/secondary education implementation, and context-specific frameworks. Future research must shift from documenting AI's benefits in controlled, well-resourced university settings to examining how AI can serve equitable, sustainable development in diverse South Asian institutional and geographic contexts. For policymakers, this review suggests that while AI adoption is inevitable and potentially beneficial, meaningful integration requires infrastructure investment as a precondition; teacher professional development as a priority; ethical governance frameworks; contextualization within local pedagogical traditions; and research investment in currently underexplored dimensions. Only through such comprehensive, context-sensitive approach can AI education research contribute meaningfully to South Asia's ambition of providing quality education for all.

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